the case of a crane hook is deduced, and the method of Résal is explained by which the application of the formula is much simplified. The last two chapters of this section are devoted to arches and arched ribs, and to foundation and retaining walls; this is a part of the subject of the strength of materials which generally proves a great stumbling-block to the engineering student, and the authors are to be congratulated on the lucid and thorough fashion in which they have set forth the various solutions which have been found most satisfactory for problems which have been well-known subjects of controversy among engineers and mathematicians for a century or more.

The six chapters of part ii. are devoted to the physical properties of materials and the most modern methods of determining accurately the various physical constants required in the formulæ of part i. Typical testing machines are illustrated and explained, and the various types of apparatus in general use for measuring the stresses in the material undergoing test are described. The materials dealt with include iron and steel, reinforced concrete, and the other building materials employed by engineers and architects; a number of useful tables are given, and also the standard specifications proposed by the American Society for Testing Materials.

The authors have succeeded in producing a new English text-book in which the important subject of the strength of materials, the foundation upon which the whole structure of engineering science is based, is treated in a far more complete and thorough fashion than has been the case in the majority of the text-books hitherto available to the engineering student, and certain sections of it should prove of great service to those who are actively engaged in engineering design.

SCIENCE IN POETRY.

Nature Knowledge in Modern Poetry. By Alexander Mackie. Pp. vii+132. (London: Longmans, Green and Co., 1906.) Price 2*s.* 6*d.* net.

IN this book the author deals in a very interesting manner with the many references to the aspects of nature in the poetical works of Tennyson, Wordsworth, Matthew Arnold, and Lowell.

We find these poets taking delight in alluding to animated nature in many different ways. Not only do flowers, trees, and foliage of all kinds occupy a prominent place in their poems, but animal life figures almost as importantly, birds more especially.

Tennyson's references to horses and dogs show an intimate knowledge of these animals, though they do not convey the spirit of one in the habit of taking part in sport; and the author points out that Tennyson was not a sportsman. Matthew Arnold's love of dogs is also very obvious, and his poems show how much sympathy he had with them, and what a close observer he was of their ways and habits. This comes out more especially in the poems dedicated to his household pets.

Interest in the insect world is shown to a greater extent by Tennyson, for he alludes to it frequently, and always with the accuracy which reveals great knowledge. Lowell refers more especially to the bee.

Love of bird life is common to all these poets, but it is worthy of note, and also pointed out by the author, that the great characteristic of Tennyson's work is that he describes the bird's *notes* to a great extent, and has the happy knack of so doing that the bird he is referring to is unmistakable.

We gather in many ways that Tennyson was the more truly scientific man of the poets referred to. The character of his allusions and the accurate detail into which he goes are, moreover, beyond the knowledge of the casual observer. Wordsworth was more an ecstatic admirer; as the author tells us, "his outlook was broader, and in one sense less intimate" than Tennyson's. He was accurate in his descriptions, but seemed almost fearful lest an intimate knowledge should do away with the beauty and poetry of nature. He says,

> "Sweet is the lore which Nature brings;
> Our meddling intellect
> Misshapes the beauteous forms of things;
> We murder to dissect."

And again,

> "Enough of Science and of Art;
> Close up those barren leaves;
> Come forth and bring with you a heart
> That watches and receives."

In the preface to "This lawn a carpet all alive," Wordsworth appears a little more in sympathy with science, but in spite of this he still conveys the feeling that he is of opinion that nature will reveal her mysteries unsought.

Tennyson's love of geology is apparent in the frequent references to it and the similes he gives, which clearly show he must have read a good deal on this as indeed on many other less popular subjects; for instance, he does not shun allusions to the nebular hypothesis, spectrum analysis, and astronomy. It seems evident that he accepted the theory of evolution, for many quotations might be made to show it; but the author contents himself with the following, from "Locksley Hall Sixty Years After":—

> "Evolution ever climbing after some ideal good,
> And Reversion ever dragging Evolution in the mud.
> * * * * * *
> Many an aeon moulded earth before her highest, man, was born,
> Many an aeon too may pass when earth is manless and forlorn."

We see, therefore, that these poets deal largely with things of scientific interest, and all lovers of nature will find the book of great and permanent value.

OUR BOOK SHELF.

Geometrische Kristallographie. By Ernst Sommerfeldt. Pp. x+139; illustrated. (Leipzig: W. Engelmann, 1906.) Price 7*s.* net.

THE closing decade of the last century witnessed much progress made in the development of the geometrical theory of crystal structure, and we may now have confidence in the certainty of our knowledge regarding the possible types of crystalline

symmetry. This advance has not been without marked influence on the methods of determining the physical properties of crystals. The old idea to consider a crystal as a solid bounded by plane faces, the relative positions of which harmonised with Haüy's law of rational intercepts, is giving way to the more logical principle that a crystal consists of a homogeneous arrangement of discrete particles in space. Indeed, as has been frequently pointed out, a theory which ignores the internal structure cannot avoid the difficulty presented by a peculiar case of pseudo-trigonal symmetry. To the new school, which is typified most completely by Schönflies's well-known treatise, the present work belongs.

Dr. Sommerfeldt devotes a considerable portion of his book to the determination of the thirty-two classes of crystal symmetry. He establishes the four possible types of axes of symmetry in the usual way, and proceeds to evolve the classes in the following order:—the holohedral groups; the merohedral groups, comprising those possessing centres of inversion, those without such centres, but having mirror-image symmetry; and, lastly, those without such centres, and enantiomorphous. In the discussion a modification of the "Fundamentalbereich" of Schönflies is introduced. It is the smallest spherical triangle defined by the elements of symmetry. The symmetry pertaining to each class and the shape of typical simple forms are clearly illustrated by means of the admirable plates, of which there is one for each class except that devoid of symmetry. After a brief discussion of the zonal law and the linear and stereographic projections, the author proceeds to what he considers not the least interesting portion of the book, namely, the application of the methods of vector analysis to crystallography. This form of mathematical analysis is undoubtedly graced by elegance, and presents the generalised formulæ in neat guise, but its unfamiliarity to the ordinary student of crystallography seriously militates against the general utility of the book. The formulæ in question —some of which, by the way, do not lend themselves readily to arithmetical computation, and are, therefore, not of immediate practical use—could be established without greater difficulty by means of ordinary analytical geometry. Nevertheless, to the advanced student who may be versed in mathematics it would be interesting and stimulating to study a different method. The book concludes with a very complete bibliography and a good index.

Untersuchungen über künstlichen Parthenogenese und das Wesen des Befruchtungsvorgangs. By Prof. Jacques Loeb. German edition, issued with the author's cooperation, by Prof. E. Schwalbe. Pp. viii+532. (Leipzig: J. A. Barth, 1906.) Price 7.50 marks.

THE greater part of this remarkable book appeared in English dress in the Decennial Publications of the University of Chicago, and has been already noticed in our columns. As is well known, Prof. Loeb set himself some years ago the task of discovering chemical or physical methods of stimulating development in unfertilised eggs. Taking every precaution which he could conceive of, he has been able to induce artificial parthenogenesis in the ova of sea-urchins, of the annelid Chætopterus, and of the gasteropod *Lottia gigantea*. He thinks that the list will be added to as our mastery of the technique increases, for he does not believe that there is any essential peculiarity in those ova which develop in response to the artificial stimulation. As to the nature of the stimulation, Loeb is more and more convinced that it depends on setting-up or increasing oxidation processes in the ovum, and also on the synthesis of nuclein substances from the protoplasmic materials. It is possible, he says, that the two processes are interdependent, and that oxidative syntheses take place. Everyone will wish more power to this ingenious experimenter's elbow in his untiring efforts to gain control of life.

Handbook of Metallurgy. By Dr. Carl Schnabel. Translated by Henry Louis. Vol. ii. Second edition. Pp. xvi+867; illustrated. (London: Macmillan and Co., Ltd., 1907.) Price 21*s.* net.

PROF. LOUIS is to be congratulated on the completion of the translation of the second edition of Dr. Schnabel's great work. Little delay has been experienced in placing it in the hands of English metallurgists, as the corresponding German edition was not published until 1904. The volume which has just been issued contains the metallurgy of zinc, and shorter sections on cadmium, mercury, bismuth, tin, antimony, arsenic, nickel, cobalt, platinum, and aluminium. As the first edition appeared nine years ago, there have been great advances in the metallurgy of some of these metals since it was written, and these have caused many alterations and a considerable enlargement in the present volume. The changes are distributed throughout, the whole text having been carefully revised, but some of the most striking changes occur in the sections devoted to the production of aluminium on a large scale and to the electrolytic treatment of zinc. Electrolytic methods generally are fully treated, the author expressing his indebtedness to the works of Dr. Borchers for much of this part of the book.

There is little to be said in criticism of Dr. Schnabel's book. The description of alloys is usually rather meagre, with curiously slight regard to the work of the last twenty years. Then, again, the rapidity with which the Silesian zinc furnace is giving place to the Belgo-Silesian furnace does not seem to be realised by the author. In general, however, the information is full, accurate, and up to date, and is conveyed in a pleasant, readable manner.

LETTERS TO THE EDITOR.

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of* NATURE. *No notice is taken of anonymous communications.*]

The Inoculation Accident at Mulkowal.

I SHOULD like to direct the attention of your readers to this matter. The evidence regarding the unfortunate Mulkowal accident, as given in the *Lancet* and the *British Medical Journal* for February 2, and in the *Journal of Tropical Medicine* for February 1, shows that on October 30, 1902, nineteen persons were inoculated from a single bottle of Haffkine's prophylactic labelled 53N, while numerous other persons were inoculated from other bottles. A week later all the nineteen inoculated from bottle 53N developed tetanus, and subsequently died, while none of the others suffered at all. This gives a strong argument in favour of the view that the poison was associated with the contents of that particular bottle; but the evidence is clearly not mathematically absolute even on this point, while it gives no indication whatever as to when the tetanus bacillus entered the bottle. It might possibly have entered during the processes of manufacture and bottling, or later through a loosened cork, or in several ways during the opening of the bottle and the inoculation of the contents. But the commission that was appointed to consider the subject seems to have somewhat hurriedly adopted the conclusion that it actually entered during preparation, and not later. Mr. Haffkine, as head of the laboratory, was